AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. TI-118
Tel. HAzelwood 7-7831
Ext. 4463

Monday, April 13, 1959
10:00 A.M.

INVITATION FOR PROPOSALS REGARDING UNITED STATES - EURATOM JOINT NUCLEAR POWER PROGRAM

The Commission of the European Atomic Energy Community (Euratom) is prepared to receive proposals from private or governmental organizations within the Community engaged or willing to engage in power production, who wish to participate in the joint nuclear power program that recently was reflected in the Agreement for Cooperation between the United States and Euratom concerning peaceful uses of atomic energy. This Agreement was signed on November 8, 1958 and came into effect on February 18, 1959.

The program has as its primary objective the bringing into operation by December 31, 1963, within the European Atomic Energy Community, of large-scale power plants using nuclear reactors of types on which research and development have been carried to an advanced stage in the United States, having a total installed capacity of approximately one million kilowatts of electricity, except that two reactors may be selected to be in operation by December 31, 1965. It is expected that the reactors involved will be brought into operation under conditions approaching the competitive range of conventional energy costs in Europe.

The nuclear power plants under the program will be built, owned, and operated by enterprises in the Community. Title to and control over the special nuclear material employed in the program will be retained by Euratom.

Under the terms of the joint program, the projects selected for participation will be eligible to receive several special benefits. These will include financial guarantees for a 10-year operating period with respect to the fabrication cost and integrity of the fuel elements required; long-term assurance of an adequate nuclear fuel supply at prices that are comparable to those offered to industry within the United States; assurance for a 10-year period of a defined market for the plutonium recovered from the reactors; long-term capital loans to cover

NOTE TO EDITORS AND CORRESPONDENTS: This release is the complete text of the joint U.S.-Euratom invitation for proposals. It is a supplement to Release No. TI-117.

(more)

a portion of the costs associated with plant construction; and a long-term assurance by the United States Government that chemical reprocessing services will be available under terms comparable to those offered to reactor operators in the United States. It should be noted that specific ceilings have been placed on the total amount of nuclear fuel to be provided, the extent of the fuel guarantees, the amount of the capital loans, and the quantity of plutonium to be purchased. These ceilings apply to the entire program, and, accordingly, projects will be evaluated as to the extent to which they draw on these resources.

The proposals for participation under the program will be jointly reviewed and projects will be selected by the Commission of the European Atomic Energy Community and the United States Atomic Energy Commission.

In order for a reactor project to be acceptable there must be reasonable assurance that the plant involved can be brought into operation by December 31, 1963, and thereafter operated for 10 years as a source of safe and reliable power. Criteria for acceptance of proposals will include:

1) the extent to which the nuclear power plant involved is expected to approach conventional competitive power costs at the time of its completion, and its potential for improvement;

2) the extent to which the project draws on the funds, materials and services available for the joint program;

3) the extent to which the proposal contributes to the advancement of the technology of nuclear power, one of the considerations being reasonable diversity of plant types and designs; and,

4) the extent to which the project contributes to a strong and competitive atomic manufacturing equipment industry in the United States and in the Community. In addition to these criteria, Euratom will consider the need to arrive at a reasonable geographical distribution of projects within the Community. Each project must, of course, be in compliance with applicable regulatory requirements of the country in which it is to be located.

Inasmuch as one of the purposes of the program will be to provide industry in the Community and the United States with important experience and certain data on capital and operating costs, special steps will be taken by the Commission of the European Atomic Energy Community and the United States Atomic

(more)

Energy Commission to assure the prompt exchange and dissemination of the information developed. In return for the benefits received the participants in the program will be required to make available information developed on designs, plans and specifications, construction and operating costs, operations and economics.

Enterprises will not be obliged, under the program, to engage in any exchange of manufacturing "know-how" or techniques. Exchanges of this kind are expected to be the subject of licensing and other normal commercial arrangements.

As an associated objective to the installation of the plants themselves, and in order to obtain a further decrease in costs, the Commission of the European Atomic Energy Community and the United States Atomic Energy Commission also have established a joint 10-year research and development program centered on the reactors included in the program. This program will be aimed primarily at improving the performance of the types of reactors included in the program and at lowering fuel cycle costs. The information developed will be made available for the benefit of the respective industries in Europe and the United States.

Proposals for participation in the reactor program may be submitted to the Commission of the European Energy Community at any time up to September 1, 1959. The Euratom Commission will refer these proposals, when received, for joint consideration by Euratom and the United States. Those who intend to submit proposals are requested to give notice to the Euratom Commission of their interest by 45 days from day of invitation.

The United States and Euratom direct the attention of proposers to the Preamble of the Agreement for Cooperation which offers the possibility that two projects may be deferred so that their completion date may be as late as December 31, 1965.

The purpose of this provision was to enable the United States and Euratom, should they believe such deferral to be prudent in the overall interest of the joint program, to consider proposals depending on reactors designs other than those contemplated in projects which must be completed before December 31, 1963. It is the intention of the United States and Euratom that deferral of two projects be given serious consideration, although they recognise the significance of meeting the 1 million kilowatt objective by December 31, 1963.

All parties, including those proposing projects for completion by December 31, 1963, who would be interested in

(more)

bringing power plants into operation under the program by December 31, 1965 instead of December 31, 1963, are requested to so advise the Euratom Commission in writing by October 1, 1959. Following this date the Euratom Commission and the United States Atomic Energy Commission will jointly indicate whether they intend to defer any projects. If a decision is made to defer any project, proposals for these deferred projects will be solicited separately and at an appropriate time.

The details regarding the type of information desired in proposals, the types of assistance to be provided, the terms and conditions expected to govern participants in the program, and the criteria and prerequisites for consideration are set forth in the attached fact sheet. It should be noted that the Euratom Commission and the United States Atomic Energy Commission reserve the right to reject any or all proposals at their discretion. In addition, the terms of this invitation may be modified at any time.

Prospective proposers may discuss their ideas with the staff of the Euratom Commission and the United States Atomic Energy Commission before submitting their proposals, and they are encouraged to do so.

(more)

FACT SHEET ON PROPOSALS FOR PARTICIPATION IN THE JOINT EURATOM UNITED STATES POWER REACTOR PROGRAM

- - - -

A. Purpose of invitation

The purpose of this invitation is to elicit proposals which will have as their objective the bringing into operation by December 31, 1963, within the European Atomic Energy Community, of large scale power plants using nuclear reactors of types on which research and development have been carried to an advanced stage in the United States, having a total installed capacity of approximately one million kilowatts of electricity.

B. Submission of proposals

1. Who may submit proposals?

Proposals may be submitted by any person or enterprise in the Community engaged or willing to engage in power production.

2. Submission date

Proposals may be submitted at anytime but in no case later than September 1, 1959.

3. Anticipated acceptance date

The Euratom Commission and the United States Atomic Energy Commission plan to complete their review of the proposals received so as to reach a decision by December 31, 1959. However, the Euratom Commission and the United States Atomic Energy Commission will be prepared to make decisions prior to December 31, 1959 if any proposals received indicate the desirability for moving ahead on a more accelerated basis. It will be necessary for the U.S.A.E.C. to seek authority prior to entering into contracts for fuel cycle guarantees.

4. Notification of intent to submit proposals

All parties intending to submit a proposal are requested to inform the Euratom Commission, in writing by (45 days from issuance of invitation) and to provide the information

(more)

set forth in Appendix "A". All such parties will automatically receive any additional information released in connection with this program.

5. Alternate proposals

Proposers, if they so desire, may submit alternate proposals for the same project that involve different manufacturers and suppliers.

6. Eligibility of existing projects

Power reactor projects now being planned or constructed in the Community as a result of bids which already have been evaluated and accepted or for which contracts, either contingent of firm, have been entered into prior to the date of this invitation, are eligible for consideration under the conditions and criteria established for the program. Any proposal for such a project should include a statement that none of the arrangements proposed for participation under the joint program would relieve the manufacturers or principal suppliers from any commitments regarding financial matters, plant specifications or construction schedules that already had been entered into.

C. Basic Conditions

1. Location of proposed power reactor

Proposals should indicate the planned location of the reactor. The location must be within the Community.

2. Type of proposed power reactor

The proposed nuclear reactor must be of a type on which research and development have been carried to an advanced stage in the United States and there must be reasonable assurance that such a reactor will be reliable and safe in operation.

The reactor must be designed to permit operation in accordance with sound operating utility practice, particularly insofar as the permissible load variation rates, the minimum level of practical sustained power output and the total duration of stops for normal maintenance and reloading of the core are concerned.

Any special fissionable or fertile material may be used, and the reactor core may consist of several regions of differing composition.

3. Size of proposed power reactor

Ordinarily, preference will be given to proposals for reactor plants having a nuclear capacity (that is, exclusive of the power contributed by any superheater using conventional fuel) of approximately 150 MWe net, or more.

Consideration will, however, be given to plants of somewhat smaller size if such plants promise to supply power at costs that are comparable to those that can be obtained from a nuclear power plant of 150 MWe capacity.

While favorable weight will be given to plant capacity greater than 150 MWe, it is emphasized that the increased requirements of a project for materials and funds from the joint program that are occasioned by its very large size, will be a counterbalancing consideration. Accordingly, enterprises considering such projects may wish to give consideration to a proposal for more limited participation in the benefits of the program.

4. Date of operation of proposed power reactor

The proposal must provide that the plant will be brought into operation by December 31, 1963.

As a general rule, it is anticipated that the final contractual arrangements with the enterprises selected to participate in the program will be entered into by April 1, 1960; accordingly, the construction schedules contained in proposals submitted may be based on that date. As noted in paragraph B 3, there may be exceptions to this schedule and projects may move ahead on a more accelerated schedule.

5. Method of obtaining proposal

In order for a proposal to qualify for consideration, one or more U.S. manufacturers, and one or more manufacturers from the Community must participate in important roles in the construction of the project, and the project proposed for participation will have to be based on arrangements resulting from the solicitation, from within the Community and the United States, on an open, non-restrictive basis, of competitive tenders for a nuclear reactor of the size desired by the enterprise.

D. Types of assistance that may be requested

1. Fuel cycle guarantees

The United States Atomic Energy Commission will offer guarantees designed to limit certain financial risks associated with fuel cycles (See Appendix "C" for details). (1)

These guarantees will provide that fabrication charges to a reactor operator will not exceed a level specified by the AEC and/or that the fuel elements under irradiation will achieve an AEC specified minimum integrity level. They will be offered only to the extent that equivalent or better guarantees are not available commercially. In addition, apart from joint consideration of the proposal, commercial guarantees on the performance of the reactor and fuel must be considered acceptable to the United States Atomic Energy Commission in its special capacity as guarantor of the integrity life and initial cost of the fuel elements.

The liability of the United States Atomic Energy Commission will be limited to meeting guaranteed maximum charges for fabricated fuel elements and to the adjustment of charges for fabrication, chemical reprocessing and transportation of fuel elements when required by failure to meet the guaranteed integrity.

Unless otherwise agreed the guarantees provided by the United States Atomic Energy Commission will be applicable to all loadings, meeting the specifications and conditions of Appendix "C", made in a reactor under the joint program during the first ten years of its operation or prior to December 31, 1973 (or December 31, 1975, for not more than two reactors selected under the program) whichever is earlier.

2. Capital loans

Under the terms of the program the reactor projects selected will be eligible for special assistance in the financing of the capital costs.

---

(1) This Appendix to be made available upon request.

(more)

Subject to the conclusion of formal negotiations, now well under way, and to the approval by the Council of Ministers of the terms and conditions, the Export-Import Bank would be prepared to open a line of credit in favor of Euratom for the purpose of assisting in the financing of nuclear power reactor projects, selected under the joint program. Features of the credit would be:

<u>Amount:</u> $ 135 million
<u>Term:</u> approximately 20 years
<u>Interest rate:</u> 4½%
<u>Period of grace:</u> approximately 5 years
<u>Maximum financing under Eximbank credit:</u> 40% of estimated cost of each project selected

<u>Items eligible for financing:</u>
(i) equipment, materials and services for the design and construction of nuclear power reactors of types developed in the U.S.A.
(ii) engineering and technical services
(iii) fabrication of initial fuel elements
(iv) interest during construction

3. <u>Provisions of fuel</u>

Under the terms of the Agreement for Cooperation in existence between the European Atomic Energy Community and the United States, the United States has agreed to sell to the Community a net amount of up to thirty thousand (30,000) kilograms of contained U-235 in uranium for use in agreed upon projects in the joint program. Payment for special nuclear material fuel inventory may be made on a deferred basis. The United States is required under its legislation to retain the equivalent of what, under U.S. law, is described as a first lien on any such material sold to Euratom for which payment is not made in full at the time of transfer. Euratom will acquire and retain title to special nuclear material so purchased and employed in the program and will retain control over the material.

It is expected that the participants under the program will enter into long-term contracts with the Euratom Supply Agency, which will provide them with an adequate assurance as to the availability of such material for their projects. This material will be made available to the users by the Supply Agency on terms and conditions to be published as soon as possible. It should be noted that the uranium supplied may be enriched up to 20 percent by weight in the isotope U-235. The Supply Agency will

(more)

charge the user with a percentage of the stated value of the material. For the first ten (10) years of operation this percentage will be 4% per annum (1) plus administrative and handling costs. The fuel contract also will provide that user shall pay for burnup and losses on a current basis and shall provide for periodic settlements for the consumption of fuel subject to final settlement upon the reprocessing of the material returned.

4. Purchase of plutonium

Under the terms and conditions to be agreed, the Euratom Supply Agency will be prepared to enter into long-term contracts with reactor operators under this program, under which it will compensate these operators for the plutonium recovered from the reactors involved. These contracts ordinarily will be for ten (10) years of operation of such reactors or until December 31, 1973 (or until December 31, 1975 for not more than two reactors selected under the program) whichever is earlier.

5. Chemical reprocessing

Pending the coming into being of facilities in the Community or the United States to process fuel irradiated under the program, the utilities and reactor operators involved will receive a long-term assurance that adequate facilities will be available to process their fuel. The United States Atomic Energy Commission, accordingly, will be prepared to perform, on terms and conditions to be agreed, reprocessing services with respect to any source or special nuclear material received by the European Atomic Energy Community from the United States under this program. Such reprocessing services will be available under terms comparable to those offered to reactor operators in the United States and will be performed at established domestic prices in effect in the United States upon delivery of such material. It is anticipated that any withdrawal by

(1) This percentage is based on the interest rate to be incorporated in the arrangement for deferred payment by the Euratom Supply Agency to the United States Atomic Energy Commission, to be executed pursuant to Article III of the Agreement for Cooperation. Suitable arrangements will be made between the Supply Agency and the users to provide for payment by the users after the initial 10 year period, of the debt incurred for the fuel inventory.

the United States Commission of chemical reprocessing services will be based upon the availability of commercial facilities to meet requirements for such services at reasonable prices, including the requirements of projects in the joint program. The United States Atomic Energy Commission will give written notice of the non-availability of its chemical reprocessing services 12 months prior to such non-availability.

E. Conditions for consideration of proposals

In order to be eligible for consideration, the proposal must meet the basic conditions set forth in Section C and the Euratom Commission and the United States Atomic Energy Commission must determine that there is reasonable assurance that:

(1) the reactor can be brought into operation by December 31, 1963,
(2) the reactor can serve as a source of safe and reliable power, and
(3) the proposer and his principal contractors are technically and financially competent to meet the responsibilities entailed in the proposal.

In addition, the proposals must:

(1) Contain, where applicable, the technical, safety, financial and other information in the form and degree of detail specified in Appendix "B". (This Appendix will be furnished on request).

(2) Contain a firm undertaking by the utility that a specified nuclear power plant will be built if the proposal is accepted. This should be evidenced by, among other things, a binding commitment by a manufacturer or manufacturers, contingent only upon the receipt of necessary statutory licenses and permits and the availability of financial protection against third party liability.

(3) Not be contingent on the award of any research and development contract under the program or the successful outcome of any experimental program related to the proposal.

(4) Contain assurance that the proposers will undertake to obtain all necessary licences and permits and will comply with all pertinent laws, regulations and orders of appropriate authorities.

(5) Indicate an agreement on the part of the proposer and his principal contractors to comply with the reporting requirements outlined in Appendix "D".

(6) Indicate an agreement that representatives of Euratom and the United States Atomic Energy Commission will be entitled to access, at all reasonable times, to the nuclear power plant and its associated facilities in order to obtain technical and economic data related to the construction and operation of the plant.

(7) Indicate the terms and conditions under which the proposer will be willing to make the plant available for research and development studies and for training purposes. It is anticipated that any such research and development work will be primarily oriented toward improving the economics of the plant involved.

(8) Evidence the solicitation of competitive tenders by providing a list of the principal suppliers consulted and a summary of the tenders received.

(9) Contain all information in clear and concise accounts on the scope of the guarantees and warranties on the performance of the plant including the fuel that have been agreed to by the prospective suppliers.

(10) Contain, to the extent possible, a preliminary endorsement or a formal approval of the competent national or regional authority regarding the selection of the site.

(11) Indicate whether the proposer desires to receive any of the fuel element guarantees offered under the joint program and if so, provide the information requested in Appendix "C".

(12) Set forth any patents, pending patents, or other restrictions on consumable material such as fuel elements, that might affect the supply and cost of subsequent loadings, and

(13) Include a schedule of the estimated project requirements for U-235 for a 20 year period as well as of the anticipated plutonium that will be produced over this same period.

F. Criteria for evaluation of proposals

The Euratom Commission and the United States Atomic Energy Commission will jointly evaluate the proposals received against the following criteria:

(more)

1. The extent to which the nuclear power plant is expected to approach conventional competitive power costs at the time ofits completion, and its potential for improvement, including the plans of the operator to take advantage of this improvement.

2. The extent to which the plant meets the desired minimum size of 150 MWe or promises to supply power at costs that are comparable to those that can be obtained from a plant of such a size.

3. The extent to which the project is likely to contribute to a strong and competitive atomic equipment industry in the United States and in the Community.

4. The extent to which the project may draw on the funds, materials and services available for the joint program.

5. The extent to which the project contributes to the advancement of technology of nuclear power, one of the considerations being a reasonable diversity of plant types and designs.

In addition to these criteria, Euratom will consider the need to arrive at a reasonable geographical distribution of projects within the Community.

G. Security for construction and operation of the power plant

Successful proposers will be expected to undertake the obligation to build the plant by December 31, 1963, and to operate it for a period of 10 years from the date of completion of construction. The Euratom Commission and the United States Atomic Energy Commission may require security (e.g. a performance bond) that the commitment to build the plant be fulfilled.

If a proposer is a subsidiary of a company or a member of an affiliate group, the principal or the group, as the case may be, may be required, jointly and severally, to guarantee fully performance of the undertakings set forth in the proposal.

H. Possible deferral of two projects under the program

The United States and Euratom direct the attention of proposers to the Preamble of the Agreement for Cooperation which offers the possibility that two projects may be deferred so that their completion date may be as late as December 31, 1965.

The purpose of this provision was to enable the United States and Euratom, should they believe such deferral to be prudent in the overall interest of the program, to consider proposals depending on reactor designs other than those contemplated in projects which must be completed before December 31, 1963. It is the intention of the United States and Euratom that deferral of two projects be given serious consideration, although they recognise the significance of meeting the 1 million kilowatt objective by December 31, 1963.

All parties, including those proposing projects for completion by December 31, 1963 who would be interested in bringing power reactors into operation under the program by December 31, 1965 instead of December 31, 1963 are requested so to advise the Euratom Commission in writing by October 1, 1959 and to provide the information set forth in Appendix "E". Following this date the United States and Euratom will indicate whether they intend to defer any projects. If a decision is made to defer any projects, proposals for these deferred projects will be solicited separately and at an appropriate time. It is presently contemplated that such a solicitation, if made, would not take place prior to January 1, 1961.

I. <u>Rejection of proposals</u>

The Euratom Commission and the United States Atomic Energy Commission reserve the right to reject any or all proposals at their discretion.

J. <u>Modification of invitation</u>

This invitation may be modified after its release and additional information may be requested from proposers in the course of the review of proposals.

K. <u>Applicability of Euratom Treaty, Agreement for Cooperation and laws and regulations</u>

This invitation and all activities in connection with the joint program are subject to the Treaty constituting the European Atomic Energy Community, the Agreement for Cooperation between Euratom and the United States signed at Brussels on November 8, 1958, and the provisions of applicable laws, regulations, and other legal requirements in effect in the United States, the Community and member states.

(more)

L. Liability

The Government of the United States shall not be liable for any damages or third party liability arising out of or resulting from the joint program.

M. To whom proposals must be submitted

Twenty copies of each proposal should be addressed to:

EURATOM COMMISSION
51, rue Belliard
Brussels, Belgium

and marked: "Proposal submitted for Euratom - United States Joint Program".

Proposals may be submitted in one of the four languages of the Community or in the English language.

N. Participation in joint research and development program

It is recognized that enterprises may also wish to participate in the Joint Euratom - United States research and development program which is to be centered on the types of reactors to be constructed under the program. Further details regarding this program may be found in the "Guide for submission of research and development proposals under Joint Euratom - U.S. Program" which will be made available upon request.

(more)

APPENDIX "A"

I. Identity of proposer

Name

Business address

Seat (Legal address)

Legal status

II. Most recent financial statement

Annual report

Balance sheet

Profit and loss statement

Accountant's report (if available)

III. Financial and/or other relationship between proposer and operator of project, if these are different persons.

IV. Brief description of the project including:

Location

Size of plant (Net electrical capacity)

V. Details on how the project may be financed

VI. Plans for the distribution of the electricity to be generated

APPENDIX "B"

I. INTRODUCTION

A. Official Application

B. Engagement

C. Presentation of Technical and Other Information

D. Classification of Data

II. TECHNICAL INFORMATION

A. Summary

B. Reactor

C. Primary Circuit and Steam Generating Units

D. Radiation Considerations

E. Turbine Generator and Steam Cycle

F. Electrical System

G. Plant Instrumentation and Control

H. Civil Works

I. General Services

J. Other

III. REACTOR HAZARDS AND RELATED CONSIDERATIONS

A. General

B. Site Data

C. Release of Contaminants to Environment

IV. MATERIALS REQUIREMENTS

A. Schedule

V. FINANCIAL AND ECONOMIC DATA

A. The Proposer(s)

B. Economic Justification of Proposed Increase

C. The Project (Atomic Power Plant)

D. Estimated Capital Cost of Project

E. Financing of Capital Costs of the Project and Commitment to Operate Project for Ten Years

F. Ability to Repay Euratom Loan

G. Expansion Program of utility Companies which will own and operate the projects.

H. Proposed Method of Financing Cost of Research and Development Program

I. Estimated Operating Cost Data of Proposed Nuclear Power Plant (7,000 hrs./year at full power)

VI. MISCELLANEOUS

A. Guarantees and Warranties

B. Insurance and Third Party Liability

C. Experimental Program

D. Research Program

E. Training Program

F. Over-all Project Schedule

I. INTRODUCTION

A. Official Application

An official application from the Proposer to the Community must be submitted for acceptance of the proposed power plant project under the terms of the EURATOM - U.S. Agreement. The proposing party will undertake to abide by the clauses and conditions of the Agreement as well as by those of the present invitation.

B. Engagement

There must be submitted a confirmation of the formal engagement of the tendering party to construct the power plant within the stipulated time and to operate it for a period of at least ten years from the date of its entry into service in case of acceptance of the project under the terms of the Agreement.

C. Presentation of Technical and Other Information

An outline of the technical and other portions of the bid, containing specific information desired by Euratom - U.S., is presented herein. It is suggested that the bidder follow the form indicated by this outline. The bidder should supply as much as possible of the information requested, as well as any additional information he deems necessary, in order to have his bid properly evaluated.

D. Classification of Data

All information submitted by the proposer shall be treated as confidential data and withheld from public or other disclosure insofar as this information has not been made public according to national practice or legislation.

II. TECHNICAL INFORMATION

A. Summary

1. A brief general description of the plant including site layout

2. Tabulation of Plant Data:

   a. Type of reactor

b. Power level (MW)

(1) Thermal (nuclear)
(2) Thermal (conventional, if any)
(3) Gross electric
(4) Net electric

c. Number of loops

d. Number of turbines

e. Fuel elements

(1) Type
(2) Composition
(3) Enrichment
(4) Dimensions
(5) Density
(6) Cladding material
(7) Cladding thickness
(8) Lattice pitch

f. Moderator

(1) Material
(2) Temperature and pressure
(3) Volume ratio (liquid to fuel)

g. Core (by regions)

(1) Number of assemblies
(2) Number of rods or plates per assembly
(3) Active height
(4) Effective diameter
(5) Weights of material in Kgs

h. Control rods

(1) Number and type
(2) Type of drive mechanisms and location

i. Pressure vessel

(1) Material
(2) Dimensions

j. Containment shell

(1) Shape and dimensions

k. Coolant

(1) Material
(2) Temperatures and pressures
(3) Flow

l. Turbine inlet conditions

(1) Pressures and temperatures
(2) Flow

m. Heat transfer conditions

(1) Surface area
(2) Heat fluxes
(3) Heat flux ratios max/avg
(4) Power density
(5) Specific power

n. Fuel burn-up

(1) MWD/T avg.
(2) MWD/T max.

o. Neutron fluxes

(1) Thermal
(2) Fast

p. Neutron balance

(1) Initial K-eff
(2) Absorption distribution
(3) Initial conversion ratio

B. <u>Reactor</u>

1. Reactor vessel and internal parts

a. Description giving general arrangement, dimensions, design and operating stresses and weights.

b. Discussion of design codes utilized and factors of safety employed.

2. Fuel Elements

   a. Detailed description with drawings giving all important dimensions, characteristics, coefficients, etc.

   b. General method of fabrication, quality, control and inspection

   c. Burn-up data, design and guarantees for all cores.

   d. Discussion of fuel element failures, their detection and handling.

   e. Fuel element cycling procedures.

   f. Material composition of the fuel elements after irradiation.

   g. Special preparation of the element for shipping, if any.

3. Reactivity Control System and Characteristics

   a. Detailed description of control rods, their drive mechanisms, operation and characteristics.

   b. Description of methods of flux-flattening

   c. Description of other safety systems

   d. Control characteristics information, including:

      (1) initial and maximum excess reactivity
      (2) control rod worth
      (3) auxiliary control worth
      (4) shutdown reactivity
      (5) pressure reactivity
      (6) temperature reactivity
      (7) effect of xenon and samarium
      (8) xenon formation on shut-down and power variation
      (9) void coefficient of reactivity
      (10) effect of burn-up on reactivity
      (11) spatial distribution of power

4. Reactor Physics Data

   a. Detailed discussion of the reactor physics associated with:

      (1) core size
      (2) moderator
      (3) coolant
      (4) fuel and cladding
      (5) other structural material

   b. Total mass of fissile material, fertile material, initial enrichment, final enrichment.

5. Heat Transfer and Fluid Flow

   a. Discussion of all pertinent heat transfer and fluid flow characteristics of the design.

   b. Coolant flow pattern and design philosophy.

   c. Discussion of core conditions limiting power output.

C. <u>Primary Circuit, Steam Generating Units, Auxiliaries</u>

1. Primary circuit

   a. Detailed description with drawings showing all major equipment in the primary circuit and giving approximate locations, sizes, and types of principal instruments, valves, pumps, piping, etc.

2. Steam Generating Units

   a. Detailed description with drawings showing steam generating equipment, designs, operating characteristics, etc.

3. Main blowers or pumps

4. Emergency blower drives and pumps
5. Pressurizer
6. Primary and Secondary coolant systems
7. Emergency Power Systems
8. Emergency Cooling Systems
9. Fuel and Control Rod Handling Systems

D. <u>Radiation Considerations</u>

1. Biological Shielding
    a. General description with over-all design, layout and dimensions
    b. Design basis, accessibility, special provisions for cooling
2. Provisions for Containment
    a. Overall design and dimensions
    b. Design basis
    c. Integrity, closures, ventilation, cooling spray systems, missile protection, etc.
3. Decontamination
    a. Provisions for decontamination of primary systems
    b. Provisions for decontamination of secondary and auxiliary systems

E. <u>Turbine Generator and Steam Cycle</u>

1. Turbine
    a. General description and principal characteristics
    b. Auxiliary equipment and instrumentation
    c. Weights and dimensions

2. Generator

    a. General description and principal characteristics

    b. Auxiliary equipment and instrumentation

    c. Weights and dimensions

3. Steam Condensing Plant

    a. General description and principal characteristics

    b. Auxiliary equipment and instrumentation

    c. Detailed operating characteristics

4. Turbine Cycle

    a. Flow diagram

    b. Description and characteristics of auxiliary equipment

    c. Specification of chemical quality required for steam and water

F. <u>Electrical System</u>

1. Plant layout and power requirements

    a. Plant electrical diagram

    b. Details of plant power consumption

2. Emergency Supply System

    a. Description and principal characteristics

3. Auxiliary Transformers, Switchgear, and Cables

    a. Description and characteristics

4. Protective Equipment

    a. Description and characteristics

5. Lighting System

    a. Description of normal and emergency system

G. <u>Plant Instrumentation and Control</u>

1. Overall Plant Control

    a. General description and layout

2. Reactor Control and Instrumentation System

    a. Detailed description of :

        (1) Reactivity control
        (2) Neutron detection system
        (3) Mechanical and thermal detectors
        (4) Neutron source
        (5) Measurement of flux distribution
        (6) Ruptured fuel element detection
        (7) Radioactivity detection

3. Primary and Secondary Loop Control and Instrumentation

    a. Measurement and control devices

    b. Detection of impurities

    c. Other monitoring devices

4. Electrical System

    a. Detailed description of measurement, control and protective devices

H. <u>Civil Works</u>

1. Site Layout

    a. Pertinent site information not otherwise presented in section III-B of this appendix

2. Design

   a. General description of the overall design

   b. Plan and elevation drawings for all civil work

3. Special Construction Equipment Required

I. <u>General Services</u>

1. Fire System

   a. Description

2. Communication System

   a. Description

3. Ventilating and Air Conditioning

   a. Description

4. Laboratory

   a. General description including equipment supplied

5. Workshop

   a. General description including equipment supplied

6. Lifting and Transport

   a. Description of equipment supplied

7. Spare Parts

   a. Detailed list of spare parts supplied

J. <u>Other</u>

1. Future Potential of the Plant

   a. Discussion of the possibility of increasing the reactor power and/or reducing the unit power cost after the first loading

b. Excess capacity (if any) provided in the various sections of the installation and/or possibility of adding additional units to take advantage of any future increase in the reactor heat output

2. Functioning of the Installation

a. Analysis of overall system with reference to dynamic stability

b. Start-up procedure

c. Full power operation

d. Normal and emergency shutdown

3. Number and Types of Operating Personnel Required

4. Plant Heat Balance

III. REACTOR HAZARDS AND RELATED CONSIDERATIONS

A. General

1. General description of over-all project with particular emphasis on safety features, such as use of containment, missile protection, shielding, provisions for unfavorable seismological conditions, etc.

2. Description of reactor plant with particular emphasis on safety aspects such as inherent safety design characteristics, use of closed loops, controls and instrumentation, shielding, blast protection, failsafe features, waste disposal facilities, etc.

B. Site Data

1. Justification for the choice of the site

2. Plan or plans showing the boundaries and dimensions of the site, the location of the various parts of the plant, topographical features on and near the site, and nearby facilities either existing or anticipated, such as roads, railroads, factories, residential areas, schools, hospitals, etc.

3. Population density including its variation and land usage within 50 kilometers of the site; both numerical information and a map showing urban area.

4. Natural environments of locality on general qualitative basis:

   a. Meteorology - Wind velocities, directions and frequencies; amounts and frequency of precipitation; frequency and persistence of expected worst conditions; topographic features which might affect wind flow.

   b. Hydrology - flow rates of nearby streams and sea currents, and use by public, location and use of wells, depth to ground water; sources of public drinking water in surrounding areas.

   c. Natural Radioactivity - maximum and minimum levels, source and distribution within or adjacent to the site.

   d. Geology - the existence of formations which might affect the escape of contaminants to surface or subsurface water bodies. Soil conditions and nearby test borings if available.

   e. Seismology - history of earthquakes and their intensities in that region of the country; existence of geological features which might indicate the possibility of serious tremors.

5. Explanation of present and intended future use of land upon which reactor is to be located; also, the land in the nearby vicinity. The proposer should indicate what impact, if any, his project might have on other economic and/or social projects located nearby.

C. <u>Release of Contaminants to Environment</u>

1. Estimate of the amounts and source of gaseous, liquid and solid radioactive waste which are

expected to be routinely released to the environment together with estimates of effects on the environment and procedures to monitor, dilute and control these releases.

2. Types of accidents considered credible, and preliminary estimate of frequency and consequences. Special features of reactor design to prevent these accidents.

3. Preliminary estimate of the maximum credible accident including amount and character of fission products released to containment vessel. Also, estimate of the potential doses from gamma shine and leakage of fission products including fallout at the site boundary and at nearby communities under adverse weather conditions. Assumptions and references used in these calculations are to be stated.

4. Possibility and safeguards against contamination of nearby streams or other water supplies from the fission products retained in the plant container or released following the maximum credible accident.

IV. MATERIALS REQUIREMENTS

A. Schedule

The following form should be used to present a complete material balance for each source, special nuclear, and/or other material (such as D_2O) used in the project.

MATERIAL REQUIREMENTS SCHEDULE

QUANTITY

(In kgs for each six month period from initial withdrawal until equilibrium)

1. Material..........

2. Withdrawals

   a) Enrichment

3. Returns

   a) Enrichment
   b) Pu
   c) U-233

4. Inventory

a) Storage
b) Fabrication
c) Processing
d) Transit
e) In reactor

V. FINANCIAL AND ECONOMIC DATA

A. The Proposers

1. If the project is to be owned and operated by an existing company now in operation:

a. Name of proposer

b. Detailed description of properties and operations, including maps, etc.

c. Principal ownership (major stockholding interests).

d. History

e. Charter

f. Government regulation and franchises

g. Financial information;

(1) Detailed annual balance sheets and profit and loss statements for the last five years (accompanied by accountants and financial reports).

(2) Stockholders or other public reports for last five years.

(3) Legal and financial links with financial or industrial groups or with the Government.

(4) Working capital from latest financial statement:

Current Assets (a)

Current Liabilities (b)

Working capital (a - b)

Ratio (% of a to b)

(5) Plant and equipment from latest financial statement:

Gross depreciable assets

Accumulated depreciation

Net book value

Insured value of assets

Annual depreciation charged to income (current year)

Statement of depreciation policy and methods

(6) Long-term and intermediate-term debt from latest financial statement. 1/

Issue	Amount	Maturity Date	Interest Rate	Security	Rank	Repayment Schedule

Describe any mortgage or other lien on the assets of the company.

(7) Equity from latest financial statement:

Total Assets

Total Liabilities

Equity

(8) Dividends paid in last five years and brief statement of dividend policy.

(9) Describe restrictions on dividends, borrowing, additional stock issuances, etc. in indentures, charter, etc.

(10) List significant financing through sales issues of stock, bonds, etc., in recent years.

1/ Intermediate term debt 2 to 5 years, long term debt longer than 5 years.

h. Operations:

For each of last five years state:

(1) Maximum system demand (kw), energy (kwh) generated, purchased, interchanged.

(2) Number of customers by types

(3) Energy sold by type of customers

(4) Revenues by type of customers

(5) Typical daily load curve

(6) Operating expenses by major classifications (Segregate between generation, transmission and distribution)

i. Technical experience in nuclear energy field.

2. If the project is to be owned and operated by a new company now formed or planned, furnish for each company or institution participating in the new company the information listed for each item under 1. Show participation in project of each participant in amount and in per cent of total participation.

B. <u>Economic Justification of Proposed Increase in Capacity</u>

1. Detailed economic justification of proposed increase in capacity including the following information:

a. Description of the supply and demand for electricity in the region which is presently supplied by the power system with which the projected atomic power station will be connected, including output statistics for the last five years. Reference may be made to A 1 (h) and A 2 (h).

b. Projected maximum demand (kw), system input (kwh), and sales (kwh) curves for the next ten years.

c. Probable trend of power supply in the region for the next ten years.

d. Transmission facilities with network production diagram.

e. Description of the generating costs and rates prevailing in the region.

f. Description of Public Authority regulation regarding rates.

g. Relationship of rates to changes in price level (past and estimated future).

C. <u>The Project (Atomic Power Plant)</u>

1. Summary description of project. This should include:

   a. Statement as to organizations which are proposed to undertake the different portions of the over-all project, such as research and development, construction of the plant, fabrication of fuel elements, and operation of the plant.

   b. Contracting methods (e.g. cost-type, lump-sum, etc.)

2. For each major contractor, including reactor design agent and/or construction agent (including fuel fabricator):

   a. History of company, including summary of major construction jobs carried out.

   b. Legal organization.

   c. Description of research and development and production facilities.

   d. Description of existing contractual obligations in nuclear energy field.

   e. Technical experience in nuclear energy field.

   f. Description of project organization and personnel assigned to project.

   g. Most recent statement of financial position and earnings.

   h. License arrangements relating to the project.

D. Estimated Capital Cost of Project

1. Generation facilities; [x] — Amount by years and total [xx]

   a. Land and land rights

   b. Buildings and structures

   c. Nuclear system

      (1) Reactor and associated equipment

      (2) Initial fuel fabrication (exclude cost of nuclear fuel)

      (3) Other

   d. Superheater

   e. Turbo generators

   f. Other (specify)

   g. Total generation facilities

   h. Cost per installed kw.

2. Transmission facilities:

   (Show principal items of plant required to tie in with existing system)

   a. Total transmission facilities

3. Engineering, design, and services

4. Total of items 1, 2, and 3

5. Startup costs

6. Contingencies

7. Escalation

8. Interest during construction (how determined)

9. Total estimated cost of project

   a. Cost per installed kw

---

x Show major types and units of building and equipment.
xx Show amounts applicable to each year of construction.

E. Financing of Capital Costs of the Project and Commitment to Operate Project for Ten Years

1. If the project is to be owned and operated by an existing company now in operation:

   a. Statement showing how available funds are to be used in construction of project in accordance with construction schedule and for working capital.

   b. Statement showing how funds will be raised from:

      (1) Own funds

      (2) Euratom

      (3) Direct and indirect government assistance

      (4) Other borrowings (Show details)

   c. State guarantees and security which proposer is willing to offer to obtain financial assistance. Furnish information as to financial standing of guarantors, if any.

   d. Statement of methods by which proposer intends to meet his commitment to operate the project for ten years.

   e. Statement of action taken to meet any existing monetary exchange regulations.

2. If the project is to be owned and operated by a new company now formed or planned, furnish the following information:

   a. Statement showing how available funds are to be used in construction of project in accordance with construction schedule and for working capital.

   b. Statement showing how funds and amount will be raised from:

      (1) Each participant forming new company, State participation and limits of liability of each participating party, together with commitments made by each participant in excess stated initial liability. Specify if these commitments or guarantees are expressed in writing.

(2) Euratom.

(3) Direct and indirect government assistance.

(4) Other borrowings.

c. State guarantees and security which participants are willing to offer to obtain financial assistance. Furnish information as to financial standing of guarantors, if any.

d. Statement of methods by which participants intend to meet their commitment to operate the project for ten years.

e. Statement of action taken to meet any existing monetary exchange regulations.

F. <u>Ability to Repay Euratom Loan</u>

1. If the project is to be owned and operated by an existing company now in operation:

a. An estimated earnings statement for the first year beginning a year after the project is in operation setting forth:

Revenues (from power)	. . . . .
Other income (detailed by type)	. . . . .
Total	. . . . .
Operating expenses by principal classifications	. . . . .
Taxes (income taxes and other taxes)	. . . . .
Depreciation (explain basis)	. . . . .
Operating income	. . . . .
Debt service (interest and amortization by issues)	. . . . .
Dividends	. . . . .
Balance	. . . . .

State clearly all assumptions made in preparing this estimate.

2. If the project is to be owned and operated by a new company now formed or planned, furnish for the new company and for each company or institution participating in the new company the information listed under 1 above. Furnish under revenue as to the new company the amount of revenue expected to be obtained from each participant.

G. Expansion Program of Utility Companies which will Own and Operate the Projects

1. If the project is to be owned and operated by an existing company now in operation:

   a. Description and estimated cost of expansion (construction) of company for next five years, by years and by major classifications, such as generating plants, transmission lines, sub-stations, distribution, etc.

   b. Proposed method of financing the above program by:
      (1) Own funds

      (2) Direct or indirect government assistance

      (3) Borrowings

      If borrowings are expected to be secured by mortgage, etc. explain.

2. If the project is to be owned and operated by a new company now formed or planned, furnish for each company or institution participating in the new company the information listed under I. a. and b.

H. Proposed Method of Financing Cost of Research and Development Programs

	Amounts to be financed by		
	Joint Program	Proposer	Total

1. Research and Development costs in connection with:

   a. Reactor design and construction:

      (1) Design (describe and list specific Research and Development programs)

(2) Construction (describe and list specific Research and Development programs) (1)

b. Operations (describe and list specific items of an experimental nature for which Euratom assistance is required)

c. Fuel cycle

---

(1) Show amounts applicable to each year. Details of R&D programs are to be given in accordance with section VI-D of this Appendix.

I. Estimated Operating Cost Data of Proposed Nuclear Power Plant (7,000 hrs./year at full power)

	Cost for first 10 years of operation		Annual Steady-State costs	Cost of generating power by a conventional system 5/	
	Each year	Total			
	A	B	C	D	E
1. Revenue :					
1.1. Sale of power (No of KWH)					
1.2. Other (Show source such as irradiation services, isotopes, etc.)					
TOTAL (1)					
2. Expenses :					
2.1 Reactor and Steam generating system					
2.1.1. Fuel cost : 1/					
2.1.1.1. Fuel fabrication and assembly					
2.1.1.2. Material losses					
2.1.1.3. Burnup (exclusive of fuel fabrication and assembly costs)					
2.1.1.4. Transportation of spent fuel elements					
2.1.1.5. Reprocessing of spent fuel elements					
2.1.1.6. Waste storage					
2.1.1.7. Use charges					
2.1.1.8. Credit for plutonium, U.233, etc.					
TOTAL (2.1.1)					
2.1.2. Operating labor - Reactor and associated systems 2/					

	Cost for first 10 years of operation		Annual Steady-State costs	Cost of generating power by a conventional system 5/	
	Each year	Total			
	A	B	C	D	E
2.1.3. Other expenses (List major items such as maintenance, health and safety, etc. by major elements of costs such as labor, materials, etc.)					
2.1.4. Depreciation 3/					
2.1.5. Insurance 3/					
2.1.6. Property taxes 3/					
2.1.7. Interest on borrowed capital 3/					
TOTAL (2.1.) (mills per kwh)					
2.2. Conventional system (turbogenerator) (Show costs by major account classifications, including depreciation, property taxes, insurance, etc.)					
TOTAL generating expenses (2.1 + 2.2) (mills per kwh)					
2.3. Transmission expenses 4/ (Show costs by major account classifications, including depreciation, property taxes, etc.)					
2.4. Distribution expenses (Show costs by major account classifications) 4/					
2.5. Other expenses (Detail by major account classifications, such as administration, income taxes, etc.)					
TOTAL (2)					

			Cost for first 10 years of operation		Annual Steady-State costs	Cost of generating power by a conventional system 5/	
			Each year	Total			
			A	B	C	D	E
3.	Net Revenue	Total (1-2)					
4.	Other Income	Total (3+4)					
5.	Income Taxes						
6.	Net Income	Total (4-5)					
7.	Debt Retirement						
8.	Dividends						
9.	Balance	Total (6-7-8)					

1/ Show details of calculation

2/ Indicate basis of labor estimate (N° of people, etc.)

3/ Indicate basis for costs

4/ Show only expenses applicable to those facilities constructed specifically for operation of nuclear reactor

5/ To be completed by participants possessing such data or presently engaged with production of power

Column A - Show costs for each year of operation

Column B - Show total costs for first ten years of operation

Column C - Show annual "steady-state" generating costs

Column D - Show cost categories for conventional type steam plant and turbogenerator system having same capacity as nuclear plant including insurance, taxes, depreciation, etc.

Column E - Show amounts at steady state

VI. MISCELLANEOUS

A. Guarantees and Warranties

All of the components and/or characteristics of the plant which are guaranteed or for which the performance is warranted should be presented in a separate section of the proposal. Complete details of the scope and conditions of each of the guarantees and warranties should be included.

B. Insurance and Third Party Liability

A separate section of the proposal should address itself to this subject. The presentation should include a detailed account of existing policies, the status of current negotiations for new policies, and a statement of the situation concerning existing, pending, or needed legislation affecting these subjects.

C. Experimental Program

This section of the proposal should contain a general description of the proposed testing program for the plant, including all pre-critical, critical, low power, full power and acceptance tests.

D. Research Program

An outline of all research and development programs proposed for the project should be presented in a separate section. For research and development work which is included in the bid price for the reactor, a detailed description of the work, the schedule, and cost should be presented.

E. Training Program

Any personnel training programs proposed, contemplated or desired by the proposer and/or constructors should be discussed in this section.

F. Overall Project Schedule

A complete schedule for the project, including design, procurement of major components, physical construction, acceptance testing, criticality, start-up testing, and full power operation. The schedule should be presented in such a manner to indicate the relative timing for the principal components of the project such as civil works, containment shell, reactor, sub-station, etc.

APPENDIX C

GUARANTEES APPLICABLE TO FUEL ELEMENTS

I. BACKGROUND

1. The "EURATOM Cooperation Act of 1958" (PL 85-846, 8/28/58) authorised the United States Atomic Energy Commission (hereinafter designated the USC) to make guarantee contracts which shall in the aggregate not exceed a total contingent liability of $90,000,000 designed to assure that the charges to an operator of a reactor constructed under the joint program for fabricating, processing, and transporting fuel will be no greater than would result under the fuel fabricating cost and fuel life guarantees which the USC shall establish for such reactor.

2. Within the limits of such amounts as may be authorised to be appropriated in accordance with Section 261 (a) (2) of the Atomic Energy Act of 1954, as amended, the Commission is

authorised to make guarantee contracts for such periods of time as it determines to be necessary; provided, however, that no such contracts may extend for a period longer than that necessary to cover fuel loaded into a reactor constructed under the joint program during the first ten years of reactor operation or prior to December 31, 1973 (or December 31, 1975, for not more than two reactors which may be selected under the joint program to be in operation by December 31, 1965) whichever is earlier.

The benefits of the USC guarantees set forth in this appendix are offered to operators of reactors constructed under the Joint EURATOM-United States program, on a project by project basis, and will be available, unless otherwise agreed, for all loadings of nuclear fuel made in these reactors during the applicable above-stated period of time.

II. DEFINITIONS

3. For purposes of any USC guarantee made under this program, the following definitions apply:

a. Fabrication cost is the total charge made by the fuel element manufacturer to the reactor operator for clean, unirradiated fuel elements F.O.B. the manufacturer's plant. It includes all costs of fabricating, handling, packaging, uranium use charge, and the cost of converting the UF_6 to metal or other forms necessary to meet specifications. It also includes all costs incurred in assembling the fuel element. It does not include the cost of appurtenances where the design and/or the intent is to use such appurtenances with subsequent loadings. Fabrication costs also exclude the cost of uranium contained in the finished element but will include the cost of any such material lost in the process of fabrication as well as the cost of recovering any scrap material generated during fabrication.

b. Fuel element is any integral fabricated structure containing fuel for the reactor which is normally handled and loaded into the reactor as a single unit.

c. Nominal fuel loading. The first nominal loading is the weight of uranium in the fuel elements needed as an initial charge to the reactor to permit operation of the reactor at its rated power for its intended purpose plus the uranium contained in any additional elements which have replaced elements of the same manufacturer in the initial loading which have failed to meet the manufacturer's guaranteed performance. For any subsequent loading, the nominal loading shall consist of the weight of uranium in fuel elements which at the guaranteed life would provide heat equal to the heat generated in the reactor during 292 full days of rated power operation, unless some other period of time is mutually agreed to, plus the uranium contained in any additional elements supplied by the same manufacturer to replace elements in that loading failing to meet the manufacturer's guaranteed integrity life performance.

d. <u>Core</u>. In each reactor accepted under the program, the USC and proposer shall agree upon the quantity of uranium needed in the reactor to permit that reactor to reach its rated power for its intended purpose. A core shall consist of the total quantity of uranium supplied under the minimum integral number of contracts entered into to supply the above agreed quantity of uranium.

e. <u>The average irradiation level</u> of a nominal loading is the sum of the megawatt days of heat generated in fuel elements of that nominal loading which are judged to have failed for integrity reasons, plus either:

a) the sum of the megawatt days of heat generated in all other elements in that nominal loading; or

b) the megawatt days of heat guaranteed by the USC for the other elements,

whichever is greater, divided by the weight in metric tons of the uranium in the nominal fuel loading.

f. <u>Fuel element integrity</u>. The types of integrity failures and the appropriate procedures and tests for determining whether a fuel element has failed for these integrity reasons will be as agreed between the parties to the USC guarantee contract. These agreed types of integrity failures will generally coincide with, but may vary from, those specified in the commercial guarantee extended to the reactor operator. It is the intent of the USC that integrity failure will include such actual or anticipated alteration of shape or size of fuel elements as would prevent further safe or economic operation (assuming for the latter determination that no guarantees were in force) as well as breech of the cladding material. For purposes of this paragraph, economic operation is defined as the condition under which replacement of fuel elements would be to the substantial economic advantage of the operator, assuming that no guarantees were in force.

g. Transportation cost for irradiated fuel to be used for prorating under USC guarantees are only those costs for transporting irradiated fuels from a European port of shipment agreed upon by the USC and the reactor operator, to a point in the U.S. designated by the USC. The latter usually will be the site of the chemical processing plant.

h. Standard fuel cycle cost is the computed fuel cycle cost using the standard guarantees given in Paragraph 9.

III. TYPES OF GUARANTEES OFFERED

4. Two types of guarantees are offered by the USC. The first, called Type A (Processing - Transportation), provides for limiting costs of irradiated fuel processing and/or transportation, to the operator, in the event the fuel elements, for certain specified reasons, do not meet an average irradiation level guaranteed by the USC. The second, called Type B (Fabrication - Processing - Transportation), provides for adjustment of fuel fabrication costs as well as the limitation of irradiated fuel processing and/or transportation costs. These guarantees will be extended in the form of a specified fuel element minimum integrity life and/or maximum fabrication cost. Guarantees which are offered by the USC on maximum fabrication costs and minimum integrity life will be determined in accordance with the procedure described in paragraphs 11 and 18 and Annexes 1 and 2 below.

5. The USC guarantees supplement the manufacturer's guarantees and are not in lieu thereof or in support thereof. In order to qualify for a USC guarantee a manufacturer must offer certain minimum guarantees on cost and integrity life of fuel elements meeting, among other things, the requirements of paragraphs 27 and 34.

6. The Type A guarantee will usually be extended directly from the USC to the reactor operator. The Type B guarantee, insofar as fabrication costs are concerned, will generally be extended from the USC to the reactor operator through the commercial guarantor; with respect to processing and transportation costs the guarantee may be extended directly to the reactor operator or, if the commercial guarantee encompasses such costs, this portion of the USC guarantee may be extended to the reactor operator through the commercial guarantor.

7. Proposals from reactor operators which will involve USC guarantees shall include the calculations of standard and computed fuel cycle costs, guarantees, etc. specified in this appendix, based on data supplied by the commercial guarantor with sufficient back-up information to permit independent verification by the USC of the calculations. Copies of the commercial guarantees obtained by the reactor operator should also be included.

8. For purposes of computing guarantees and limiting costs, calculations shall be based on the escalated USC fabrication cost guarantee (see Paragraph 9) in effect at the time the USC extends the guarantee and the firm price offered by the commercial fuel guarantor exclusive of any escalation provisions he may have included in his offer.

IV. TYPES OF FUEL ELEMENTS COVERED

9. Guarantees are offered at this time for the following nuclear fuel elements purchased from manufacturers who qualify according to the provisions of Paragraph 28 for use in the types of reactors indicated:

a. Elements made of uranium dioxide having a U-235 isotopic concentration no greater than 3 per cent by weight, diameter (not including cladding) between 0.25 and 0.50 inches, and clad with stainless steel for use in light water cooled or organic cooled reactors:

   Standard guarantee - The integrity of these elements is guaranteed to an average irradiation level of 10,000 MWD per metric ton of contained uranium and the charge for fabrication of fuel elements starting with uranium hexafluoride is guaranteed not to exceed $ 100 (x) per Kg of contained uranium. For elements having a U-235 isotopic concentration greater than 3 per cent, but not exceeding 5 per cent, by weight, the fabrication charge guarantee shall be linearly increased $ 8 per kilogram per percent enrichment above 3 percent.

(x) Subject to escalation in accordance with the provisions of paragraph 29

b. Elements similar to those specified in paragraph (a) but clad with zirconium for use in light water cooled reactors:

Standard guarantee - The integrity of these elements is guaranteed to an average irradiation level of 10,000 MWD per metric ton of contained uranium and the charge for fabrication of fuel elements starting with uranium hexafluoride is guaranteed not to exceed $ 140 (x) per Kg of contained uranium. For elements having a U-235 isotopic concentration greater than 3 per cent, but not exceeding 5 percent, by weight, the fabrication charge guarantee shall be linearly increased $ 8 per kilogram per percent enrichment above 3 percent.

10. Manufacturers may request at any time that fuel elements of a type not included in the above list be eligible for USC standard guarantees. However, if guarantees are desired on non-included elements in the initial submission for a project which is scheduled for completion by December 31, 1963, data on the elements must be furnished to the USC not later than 45 days from the issuance date of this invitation. The 45 day period is established in order to permit all manufacturers ample opportunity to take advantage of any new USC guarantees which may be offered. This condition is not meant to preclude a reactor operator from requesting USC guarantees on fuel elements which may be other than those in his initial submission, subsequent to the acceptance of his project. It is suggested that requests from manufacturers who are seeking guarantees and who qualify according to provisions of Paragraph 28 reach the USC as soon as practicable so that prompt consideration can be given to these requests. All requests should be accompanied by supporting technical data and information substantiating the proposed guarantee. No submission date is specified at this time for guarantee requests for fuel elements for the reactors which may be deferred until December 31, 1965, and for subsequent loadings for all reactors.

V. TYPE A GUARANTEE (PROCESSING - TRANSPORTATION)

11. The Type A guarantee, which provides for limiting costs of processing and/or transportation, is available under the joint program when the reactor operator is able to acquire fuel elements under an arrangement whereby the operator's

(x) Subject to escalation in accordance with the provisions of paragraph 29 computed fuel cycle cost, using the manufacturer's guaranteed integrity life and fabrication price, is at least as good as the computed fuel cycle cost using the USC standard guarantees (i.e., the standard fuel cycle cost), but, in the case of failure before the irradiation level guaranteed by the manufacturer the remedies under the manufacturer's arrangement to supply fuel elements are not sufficient to cover the extra costs of reprocessing and transporting irradiated fuel elements and still meet the standard fuel cycle cost. The Type A guarantee may also be available if the manufacturer's guarantees are not as good as those offered by the USC, but the reactor operator elects to accept them instead of the Type B guarantee described below.

12. The Type A guarantee limits the reprocessing and/or transportation costs alone. Under it the USC will supplement the manufacturer's guarantee by guaranteeing a specified average irradiation level for integrity of the fuel elements included in the arrangement, which irradiation level in combination with the guarantee offered by the manufacturer will result in a computed fuel cycle cost equal to the standard fuel cycle cost. The irradiation level to be guaranteed by the USC will be established by the method given in Annex 2.

13. In the event of failure of fuel elements, due to a loss of integrity, to achieve the average irradiation level specified by the USC, the USC will adjust the charges for chemical reprocessing and transportation to the level that would have been incurred had the USC guaranteed irradiation level been achieve.

14. Holders of Type A guarantees must agree that if the average actual attained irradiation level of the fuel elements covered by the guarantee is greater than the irradiation level guaranteed by the USC, one-half of the resulting savings in cost of reprocessing and/or transportation of the irradiated fuel will be credited to the USC up to the sum of previous payments made at anytime by the USC under Type A guarantees for the particular reactor concerned.

The savings are defined as the total cost of reprocessing and/or transportation to the user at the irradiation level obtained multiplied by the ratio of the incremental level obtained to the guaranteed level.

VI. TYPE B GUARANTEE (FABRICATION - REPROCESSING - TRANSPORTATION)

15. A Type B guarantee, which provides for adjustment of fuel fabrication costs as well as the limitation of processing and/or transportation costs, may be requested if guarantees offered by

commercial sources supplying fuel elements would not allow the operator to meet the standard fuel cycle costs. Eligibility for consideration for a Type B guarantee will be determined by a comparison of the USC and manufacturer guarantees for the fuel elements under consideration. The applicant is eligible for consideration for a Type B guarantee if the standard fuel cost, using the USC standard guarantee, is less than the computed fuel cycle cost, using the manufacturer's guarantee. Under the Type B guarantee the USC as a supplement to the manufacturer's guarantee will guarantee a maximum fuel element fabrication cost and/or a minimum average integrity irradiation level which will enable the computed fuel cycle cost to equal the standard fuel cycle cost. If the average irradiation level does not meet that guaranteed by the USC, the USC will adjust the charges for fabrication, chemical reprocessing, and transportation to the level that would have been incurred had the guarantee been met, taking into account the manufacturers guarantee.

VII. CONDITIONS AND METHODS OF APPLICATION

16. Listed below are descriptions of the conditions and the methods by which the USC will determine the applicability and extent of a Type B guarantee. Sample calculations are given in Annex 1.

A. The average irradiation level integrity guarantee and fabrication cost guarantee extended by the fuel element manufacturer to the reactor operator are equal to or superior to those established by the USC for acceptable fuel elements of the type proposed.

No Type B guarantee will be extended by the USC. Only a Type A guarantee may be available under this condition.

B. The fabrication cost guarantee extended by the fuel element manufacturer to the reactor operator is equal to or less than that established by the USC for acceptable fuel elements of the type proposed, but the average irradiation level integrity guaranteed by the manufacturer is inferior.

Fabrication costs will not be guaranteed by the USC. Using the manufacturer's fabrication cost guarantee figure, the USC will compute, in accordance with the procedure described in Annex 1 the average irradiation level required to result in the "Standard Fuel

Cycle Cost". If this computed irradiation level proves to be equal to or less than that guaranteed by the manufacturer, no Type B guarantee of average irradiation level will be extended by the USC. If the computed irradiation level is greater than that guaranteed by the manufacturer, the USC, as a supplement to the manufacturer's guarantee, will guarantee an irradiation level equal to the computed value.

C. The fabrication cost guarantee extended by the fuel element manufacturer to the reactor operator is higher than that established by the USC for acceptable fuel elements of the type proposed, but the average irradiation level integrity guarantee extended by the manufacturer is equal to or higher than the USC standard.

Using the manufacturer's guaranteed average irradiation level, the USC will compute, in accordance with the procedure described in Annex 1, the fuel element fabrication cost required to result in the standard fuel cycle cost. If the computed fabrication cost is less than the manufacturer's quotation, the USC or a supplement to the manufacturer's guarantee will extend a Type B guarantee based on fabrication costs equal to the computed value. If the computed fabrication cost is equal to or greater than the manufacturer's guaranteed cost, no Type B guarantee will be extended by the USC.

D. The fabrication cost guarantee and the average irradiation level integrity guarantee extended by the fuel element manufacturer are inferior to those established by the USC for acceptable fuel elements of the type proposed.

The USC will extend a Type B guarantee. Since the fabrication cost and irradiation levels are both inferior to the "standard" guarantees given in Section IV, the "standard" guarantees for the particular type of element proposed will be extended by the USC to supplement the manufacturer's guarantee.

17. If, under a Type B arrangement, the USC guarantees integrity life beyond that guaranteed by the manufacturer, the reactor operator must agree that when the average irradiation level attained exceeds that guaranteed by the USC, one-half of

of the resulting savings in fabrication cost per unit reactor output, such as megawatt days, will be credited to the USC, up to the cost of payments by the USC for fabrication charges for the particular core (as defined in Paragraph 3d) concerned. The savings are defined as the total fabrication cost for that core multiplied by the ratio of the incremental life obtained to the guaranteed life.

VIII. COMPUTATION OF THE GUARANTEE

18. The USC guaranteed integrity life and fuel element fabrication cost will be the standard guarantees for elements of that type and specification unless the manufacturer offers lower fabrication costs or higher guaranteed minimum integrity life. In the latter case, if the manufacturer's guarantee does not result in as low a computed total fuel cycle cost as under the USC standard guarantee, the USC will supplement the manufacturer's guarantee to provide a computed fuel cycle cost matching that under the standard guarantee. Fuel Cycle costs to determine the USC guarantee shall be computed as described in Annex 1.

19. The fuel cycle costs include all charges for fuel element fabrication, inventory, burnup, chemical reprocessing and transportation from reactor to processing plant less credit for plutonium. Consequently, since they will be affected by the U-235 content of the fresh fuel as well as the U-235 and plutonium content of the spent fuel, they must be computed by each proposer for his fuel elements using his estimates for these quantities. In calculating fuel cycle costs it is estimated that, as a rough rule, an increase in fabrication cost of about $ 14 per kilogram for stainless steel clad elements will be compensated by an increase in integrity life of 1,000 megawatt days per metric ton. For zirconium clad elements, the corresponding figure would be about $ 18 for each 1,000 megawatt days per metric ton.

20. The calculated values obtained in accordance with the instructions in Annex 1, are to be rounded off as follows:

(a) Round up the calculated fuel element fabrication cost to the nearest dollar.

(b) Round down the calculated irradiation level to the nearest 100 MWD per metric ton.

IX. GENERAL TERMS AND CONDITIONS

21. Each Type A or B guarantee contract when entered into will contain the conditions limiting that guarantee. These conditions will generally, but not necessarily, coincide with those contained in the commercial guarantee. The USC conditions will be determined separately for each guarantee contract and will be based upon information furnished by the reactor operator and his major suppliers. The principles to be applied in prescribing USC guarantee limits will include the following:

(A) The USC guarantee to the reactor operator will not apply if failure is caused by non-observance of defined operating conditions; unless otherwise agreed, these operating conditions shall at least be those expected to permit the fuel element integrity life to reach the manufacturer's guaranteed integrity life at the designed operation level and intended purpose of the reactor.

(B) Fuel elements in loadings proposed for coverage by a USC guarantee shall be subject to acceptance tests which must be agreeable both to the USC and the reactor operator. The USC reserves the right to conduct and/or to participate in these tests.

(C) No USC guarantee will apply if failure of integrity is caused by mistakes in accuracy of fuel element specifications (as distinguished from errors in the design concept).

(D) Contractual rights shall be reserved for the benefit of the USC against the fuel element supplier to recover guarnatee payments (other than chemical reprocessing or transportation payments, which are specifically provided for below) resulting from integrity failure of fuel elements at any point below the USC guarantee level for the particular reactor loading concerned, due to non-compliance with fuel element specifications.

(E) The reactor operator shall endeavor to secure contractual rights against the fuel element supplier to reimbursement for the increased expense of transporting fuel elements to a chemical reprocessing plant and the increased reprocessing costs incurred as a consequence of integrity failure of the fuel elements at any point below the USC guarantee level for the particular reactor loading concerned, due to non-compliance with specifications; the reactor operator will pass on to the USC such rights as are secured.

(F) No USC guarantee will apply if failure of integrity is caused by any condition generally attributed to "force majeure", e.g., strike, lockout, trade dispute, war, fire, flood, confiscation, Act of God, and such other conditions as may be specified in the USC guarantee contract.

(G) No USC guarantee will apply if failure is caused by improper operation of the reactor or associated equipment, or by accidents occurring outside of the guaranteed fuel element itself.

(H) Unless the USC is notified of planned and actual withdrawal of fuel elements within a time, to be agreed upon in the contract, the guarantee will not apply.

(I) The operator must notify the USC of his intent to present a claim under the USC guarantee within a period of time, to be agreed upon in the contract, after the withdrawal of the fuel elements; otherwise the guarantee will not be applicable.

(J) Each USC guarantee contract will contain an expiration date on the guarantee therein.

22. USC guarantee contracts shall be assignable only with the consent of, and upon the conditions prescribed by, the USC.

23. The USC guarantee contracts will provide, and for uniformity, the manufacturer's commercial guarantees should provide, that they shall be construed in accordance with an governed by the law applicable in the Federal Courts of the United States in cases where the United States Government is a party, i.e., "Federal Law".

24. Except as otherwise specifically provided in a USC guarantee contract, all disputes concerning questions of fact which may arise under the contract, and which are not disposed of by mutual agreement, shall be referred to arbitration by a board composed of three competent arbitrators. One of such arbitrators shall be appointed by the USC, one shall be appointed by the other party to the guarantee contract, and the third arbitrator shall be selected by the first two. In the event that the first two arbitrators so selected are unable to agree on a third arbitrator then each of the parties shall designate another person to act as an arbitrator in lieu of the person previously appointed by such party, which two new arbitrators shall agree upon the third arbitrator. The decision of a majority of the arbitrators so selected shall be final and binding. Allocation of the costs of

arbitration shall be as determined by the board of arbitrators; provided, however, that no party shall be obliged to pay the costs of the other party's arbitrator.

To avoid inconsistent liability determinations under the USC and commercial guarantee contracts and to safeguard the interested parties, it is desirable that the USC be a participant in determinations under the commercial guarantee by either the reactor operator or the commercial guarantor. Accordingly, the disputes provision contained in the commercial guarantee contract must contain a disputes clause, agreeable to the USC, whereby the USC may participate in, and adopt, determinations reached under the commercial guarantee contract which may result in or have bearing on a claim against the USC under the USC guarantee.

25. Normally a Type A or a Type B guarantee contract will be issued only for the total number of fuel elements purchased from a single manufacturer which will comprise one nominal fuel loading necessary to operate the reactor for its intended purpose during the estimated average integrity life of that fuel loading. The USC will make appropriate provisions for interim payments, pending final settlements of amounts due and owing to a reactor operator under a USC guarantee contract.

26. Provisions will be made in the USC guarantee contracts with respect to the effect, on the commercial guarantee, of the use of experimental fuel elements, or partial loadings of such elements, developed under the joint R&D program. Normally, costs incurred as a result of using these experimental elements, will be covered by separate agreements made under that program.

27. As a condition to obtaining either a Type A or a Type B USC guarantee, the commercial guarantor must provide the USC with assurance that the integrity guarantee and fabrication price he has extended to the reactor purchaser are:

(a) in the case of the initial nominal loading, for reactors selected to be in operation by December 31, 1963, as favorable as any other guarantee and price offered by him for any comparable fuel element within the period from January 1, 1959 to December 31, 1959*); and

---

*) A time period for these purposes will be subsequently announced for such reactors as may be selected to be in operation by December 31, 1965.

(b) in the case of subsequent nominal loadings (excluding replacements for elements which have failed) as favorable as any other guarantee and price offered by him for any comparable fuel element offered for delivery within the period of time commencing 60 days prior to, and terminating 60 days after, the final delivery date specified in the contract for the USC guaranteed fuel elements.

The commercial guarantor, must also agree that if he offers a more favorable guarantee and price to anyone else within the applicable period for a comparable fuel element, he will amend the guarantee and price offered to the reactor purchaser to embody such more favorable terms. The USC guarantees will be adjusted accordingly.

Fuel elements comparable to those supplied to a reactor under this program are defined as those meeting specifications of either paragraphs 9 (a) or (b) of Section IV, for which elements the USC provides the same standard guarantee as given in the applicable paragraph, which reasonably could be used in that reactor for the same intended power level and purpose and which would be delivered within the period specified in either paragraph 27 (a) or (b) above, as appropriate.

28. In order to qualify for a guarantee by the USC, fuel elements must be fabricated by a U.S. manufacturer or by a manufacturer in a EURATOM country under agreement with a United States firm or firms. Evidence of such an agreement must be submitted with the proposal unless a U.S. manufacturer is supplying the fuel elements. A U.S. manufacturer is defined as a company organized under the laws of the United States or one of its states, and operating therein, 50% or more of the ultimate ownership of which is held by U.S. citizens.

29. Escalation will be provided for in computing the USC guarantee to be offered for any particular nominal loading. However, once a fabrication cost is computed, it will remain in effect during the term of the guarantee contract. The U.S. Bureau of Labor Statistics "Wholesale Price Index - All Commodities (Other than Farm and Food)", will be escalated. In applying this escalation, the November 1958 index of 126.8 is used as the initial base. If the May index of any year is greater or less than the base index of 5 points or more, the US guaranteed fabrication cost will be subject to change to the following July 1. Similarly, if the November index of any year is greater or less than the base index by 5 points or more, the US guaranteed fabrication cost will be subject to change to the following January 1. The U.S. fabrication costs guarantee will be adjusted by the point

change which has appeared in the index, the adjusted cost being computed to the nearest dollar.

30. The average irradiation level calculation to be used in USC guarantees will be based on a weight of fuel equivalent to the nominal fuel loading of the reactor. The proposal and request for guarantee shall indicate any preferences for measurement methods to be used in calculating average irradiation levels for the nominal fuel loading, it being understood that the measurement method actually adopted will be such as is mutually agreed between the USC and the other parties affected. Although the reactor operator has the right to discharge elements at any time, in determining whether a guaranteed average irradiation level has been attained, account will be taken only of all elements discharged because of actual failure of integrity, and all elements discharged at the same time, which, in the joint opinion of the EURATOM Commission, the USC and the fabricator involved, was required for purposes of safe operation or economic operation (assuming for the latter determination that no guarantees were in force). For purposes of this paragraph, economic operation is defined as the condition under which replacement of fuel elements would be to the substantial economic advantage of the operator, assuming that no guarantees were in force.

31. The manufacturer of fuel elements to be guaranteed by the USC under a Type A or a Type B arrangement must separately agree with the USC that the United States shall obtain a royalty-free, non-exclusive, irrevocable license, for governmental purposes to any patents on inventions or discoveries made or conceived by the manufacturer in the course of development or fabrication of fuel elements, in accordance with and subject to the conditions prescribed by U.S. law.

32. The offer of the USC to make guarantees of either Types A or B beyond those on the initial core loading of a reactor is contingent upon a showing by the operator of the reactor that he has obtained or attempted to obtain competitive bids to supply his needs for such subsequent loadings from three or more manufacturers qualified under paragraph 28. In the event the operator requests a USC guarantee on other than the bid which would impose the least contingent liability on the USC, the USC reserves the right to reduce the liability it would otherwise assume under its guarantee unless the reactor operator demonstrates to the satisfaction of the USC that the bid proposed is to the overall economic advantage of his operation.

33. Whenever the USC extends a Type B guarantee, the manufacturer must agree that the USC may inspect his facilities, processes and products, and make appropriate tests to determine that he is meeting adequate performance standards. If a European

firm is doing the work, the USC will consult with and may request the assistance of EURATOM in performing these activities. In the event that it is determined by the USC, that the fabricator is not meeting such performance standards, and the fabricator will not, after notification thereof, meet those standards, other contractual arrangements will be made for supplying fuel elements under the guarantee. Other contractual arrangements also will be made for supplying fuel elements under the guarantee if it is mutually determined between the USC and the fabricator that a more advantageous source is available. In the event other contractual arrangements are made pursuant to the foregoing, the fabricator must agree to pay any excess cost to the USC or the reactor operator occasioned by such transfer of work. The reactor operator, as part of the guarantee extended by the USC, must agree to accept fuel elements from the new supplier to the extent required to fulfill the quantities covered by the guarantee, or may, of course, continue to procure his elements from the original manufacturer without benefit of the USC guarantee.

34. Since the total contingent liability that may be assumed by the USC under this joint program must not exceed $90,000,000, the guarantees offered by commercial guarantors must prescribe a maximum fabrication cost and minimum integrity life in order to receive consideration by the USC and be eligible for participation under the fuel element guarantee program. Recognizing the wide variation in the range and extent of guarantees which may be offered, and the desirability of providing maximum flexibility in the establishment of the minimum levels of commercial guarantees, the USC will apply, as a criterion for determining eligibility for participation, the principal of pro-rata sharing. Each proposer must show, on the bases specified in this paragraph, that the cost to the USC in providing guarantees under his proposal would not exceed a pro-rata share of the $90,000,000, determined by multiplying the $90,000,000 by the ratio of the reactor net electrical power to the 1,000 megawatt goal, and the ratio of the commercial guaranteed core life to the 10-year period of the program. In the situation where options are offered for subsequent cores in which the guarantees are different from those on the initial core, the total calculated USC cost shall not exceed the sum of the pro-rata shares for the cores offered.

The USC cost shall be computed in accordance with the equation given in Annex 3. A sample calculation is also given as an example.

Proposals not meeting the above criterion may be accepted under the program if in the judgment of the USC, the advantages of such a proposal outweigh the disadvantages of increased liability within the $90,000,00 limit on the part of the USC.

35. For all guarantees involving cost of reprocessing irradiated fuels, the USC reserves the right to have such fuels reprocessed in U.S. facilities if terms and conditions more favorable to the USC are not available in the Community.

36. Proposals seeking guarantees on reactor fuel elements for loading in regions scheduled for lower burnups (determined in advance by commercial guarantor for reactivity considerations), of different claddings, diameters, enrichment levels, etc., intended to be placed in one fuel loading will be considered. However, the USC in each case will determine what the guarantees on such a fuel loading will be, whether separate guarantees for separate zones or one for the entire core. Those desiring to explore such a situation and having complete data in hand, and who intend to build a reactor utilizing such a fuel loading in the immediate future, are invited to communicate with the USC as soon as practicable.

37. Although a reactivity lifetime guarantee is a matter between the reactor operator and manufacturer, anyone seeking USC guarantees for fuel elements must make satisfactory evidence available to show that the fuel loading, in the reactor for which intended, will contain, under design operating conditions, sufficient reactivity to permit that loading to achieve the average irradiation level guaranteed for integrity purposes by the USC.

ANNEX 1

DETERMINATION OF MINIMUM INTEGRITY LIFE AND MAXIMUM FUEL ELEMENT FABRICATION COST GUARANTEED UNDER TYPE "B" ARRANGEMENT

The guaranteed integrity life and fuel element fabrication cost offered by the USC to supplement the manufacturer's guarantees will be the standard guarantees specified in Section IV, paragraph 9 of Appendix C unless the manufacturer offers lower fabrication costs and/or greater guaranteed integrity life. If the manufacturer's guaranteed life and cost are both at least as good as the USC standard guarantees but the remedies under the manufacturer's arrangement to supply fuel elements are not sufficient to cover the extra costs of reprocessing and transporting irradiated fuel elements to meet the standard fuel cycle cost, the USC will make available a type "A" guarantee at an integrity life determined by the procedure given in Annex 2. If neither the guaranteed integrity life nor fabrication cost offered by the manufacturer are equal or superior to the standard guarantee, the USC will make available a type "B" guarantee for the standard guaranteed fabrication cost and minimum integrity life. If only the life or only the cost guaranteed by the manufacturer is superior to the USC standard guarantee, then the possible supplementary guarantee by the USC is determined on the basis that, at that guarantee, the fuel cycle cost computed by the following formula is equal to the fuel cycle cost computed using the standard USC guarantee. If the USC guarantee thus computed is superior to that offered by the manufacturer, the USC will make available a type "B" guarantee at the computed cost or life. If the computed guarantee is no better than the manufacturer's guarantee, the USC will make available a type "A" guarantee at an integrity life determined according to Annex 2 provided the remedies under the manufacturer's arrangement to supply fuel elements are not sufficient to cover the extra costs of reprocessing and transporting irradiated fuel elements to meet the standard fuel cycle cost.

The computed fuel cycle cost is the sum of the annual cost of all charges for fuel element fabrication, inventory, burnup, chemical reprocessing and transportation less credit for plutonium. The formula for the computed annual fuel cycle cost at the standard guarantee is

(more)

$$F_S = T_S \left\{ C_S + (1 + 0.0075i)\, U_F - (0.99)(f)\, [(U_S - C_C) + (A-B)\, P_S] + T + f\, C_R] \right\} + \frac{i\, R_S U_F}{100} + D$$

where

F_S = annual fuel cycle costs for the standard guarantee fuel element integrity life and fabrication cost, \$ per year

T_S = annual throughput of uranium at the standard guaranteed fuel element integrity life for elements of the type and specification under consideration, kg uranium per year. T_S is computed using the formula

$$T_S = \frac{292{,}000\, P_T}{I_S}$$

P_T = reactor rated nuclear thermal power, megawatts

I_S = standard guaranteed fuel element integrity life for elements of the type and specification under consideration, megawatt days per metric ton of contained uranium

C_S = standard guaranteed fuel element fabrication cost, \$ per kg of contained uranium

i = Euratom Commission (EC) annual use charge for enriched uranium, % per year

U_F = EC charge for uranium hexafluoride of the assay of the uranium in the fresh fuel elements estimated to provide an integrity and reactivity life equal to the standard guaranteed integrity life, \$ per kg of contained uranium

f = ratio of weight of uranium in a spent fuel element providing the standard guaranteed life to the weight of the uranium in the fresh element estimated to provide that life

U_S = EC credit for uranium hexafluoride of the assay of the uranium in the spent fuel elements discharged at the standard guaranteed life \$ per kg of uranium

(more)

C_C = USC charge for the conversion of UNH to uranium hexafluoride, $ per kg of uranium

A = EC fuel value purchase price for plutonium metal, $ per gram of plutonium metal

B = USC charge for the conversion of plutonium nitrate to plutonium metal, $ per gram of plutonium

P_S = plutonium content of the uranium in the fuel elements discharged at the standard guaranteed life, grams plutonium per kilogram of uranium contained in discharged fuel elements

T = transportation cost for spent fuel elements, $ per kg of uranium contained in fresh fuel elements (commercial charges or if such are not available, assume $ 20 per kilogram plus estimated transportation costs from the reactor to the European port of shipment)

C_R = USC domestic charge from chemical reprocessing, $ per kg of uranium (exclusive of charge for turnaround time)

R_S = uranium in reactor required to permit reactor to reach design power level for its intended purpose for elements meeting integrity and reactivity life of standard guaranteed life, kg

D = USC domestic charge for turnaround time for chemical reprocessing on the basis of processing one batch of spent fuel per year.

On the same cost basis, the formula for the computed fuel cycle cost at the computed guarantee is

$$F_C = T_C \left\{ C + (1 + 0.0075i)\ U_C - 0.99g\ [(U_G - C_C) + (A-B)P_G] + T + gC_R \right\} + \frac{iR_G U_C}{100} + D$$

where

F_C = annual fuel cycle cost for the computed guaranteed fuel element integrity life and fabrication cost, $ per year

(more)

T_C = annual throughput of uranium at the computed guaranteed fuel element integrity life, kg per year = $\frac{292{,}000\ P_T}{I_C}$

P_T = as above

I_C = computed guaranteed fuel element integrity life, megawatt days per metric ton of contained uranium

C = computed guaranteed fuel element fabrication cost, \$ per kilogram of contained uranium

i = as above

U_C = EC charge for uranium hexafluoride of the assay of the uranium in the fresh fuel elements providing an integrity and reactivity life equal to the computed guaranteed integrity life, \$ per kg of uranium

g = ratio of weight of uranium in a spent fuel element estimated to provide computed guaranteed life to the weight of uranium in a fresh element

U_G = EC credit for uranium hexafluoride of the assay of the uranium hexafluoride of the assay of the uranium in the spent fuel elements discharged at the computed guaranteed life, \$ per kg of uranium

C_C = as above

C_R = as above

A = as above

B = as above

P_G = plutonium content of the uranium in the fuel discharged at the computed guaranteed life, grams plutonium per kg of uranium contained in discharged fuel elements

T = as above

(more)

R_G = uranium in reactor required to permit reactor to reach reactor design power level for its intended purpose for elements meeting integrity and reactivity life of computed guaranteed integrity life, kg

D = as above

In the formula for the annual fuel cycle cost at the standard guarantee all quantities will be known to the proposer from USC and EC announcements and reactor design information. Similarly, the data required to compute the annual fuel cycle cost at the manufacturer's guarantee will be known to the proposer. If the computed fuel cycle cost using the manufacturer's guarantees exceeds the standard fuel cycle cost, then the USC will make available a type "B" guarantee. In such cases, the USC guarantee is determined so that the computed fuel cycle cost is equal to the standard fuel cycle cost.

If the manufacturer's guaranteed minimum integrity life is greater than the USC standard, then the manufacturer's guaranteed integrity life is used for integrity life in the computation of the annual fuel cycle costs. At the manufacturer's guaranteed integrity life, reactor design data together with USC and EC announcements will determine all quantities in the above formula for the annual computed fuel cycle cost except fuel element fabrication cost. Consequently, a fuel element fabrication cost can be selected so that the computed fuel cost will equal the standard fuel cycle cost. This fuel element fabrication cost is then the computed guaranteed maximum fuel element fabrication cost.

Alternatively, if the manufacturer's guaranteed maximum fuel element fabrication charge is less than the USC standard guaranteed for elements of that type and specification, then the manufacturer's fuel element fabrication charge is used to determine the annual computed fuel cycle costs. If an integrity life is assumed, the reactor design information together with USC and EC announcements will permit the determination of all quantities in the formula for the computed annual fuel cycle cost. Integrity lives are assumed and the annual fuel cycle cost computed until the integrity life for which the computed annual fuel cycle costs equals the annual fuel cycle cost for the standard integrity life and fabrication cost is found. This integrity life is the computed guaranteed minimum integrity life.

(more)

The example below is given to illustrate the method used to determine the USC computed guarantee. The quantities used in the examples in this Annex and in Annexes 2 and 3 are assumed solely for purposes of illustrating the methods of computation and do not necessarily represent the performance to be expected in any actual reactor. In all the examples the USC charges for uranium hexafluoride for fresh fuel elements and credits for uranium hexafluoride from spent fuel elements and plutonium metal have been used since the corresponding EC charges and credits have not yet been announced. All the examples assume either stainless or zirconium clad elements meeting the specifications of paragraph 9(a) or (b).

Example:

For zirconium clad elements, the manufacturer guarantees an integrity life of 11,000 megawatt days per metric ton and a fabrication cost of $ 170 per kilogram of contained uranium.

The manufacturer's guaranteed life is superior to the standard guarantee, but the fabrication cost is inferior to the standard guarantee. Consequently, the possible USC guarantee is computed using the manufacturer's guaranteed life. It is assumed here that reactor design information for this case is the following:

For Integrity Life of	10,000 MWD/tonne	11,000 MWD/tonne
Reactor Thermal Power, Megawatts	600	600
R_g	54,000	-
R_G	-	54,000
Initial Enrichment, wt % U-235	1.50	1.52
Enrichment of spent fuel element, wt % U-235	0.755	0.725
f	0.9855	-
g	-	0.9844
P_S	4.480	-
P_G	-	4.598

(more)

Appendix C/2
Annex 1

Using above data,

$$T_S = \left(\frac{292,000}{10,000}\right)(600) = 17,520 \text{ kilograms per year}$$

$$T_C = \left(\frac{292,000}{11,000}\right)(600) = 15,930 \text{ kilograms per year}$$

From the preceding data and that from USC announcements, the following quantities are determined.

From an Integrity Life of	10,000 MWD/tonne	11,000 MWD/tonne
U_F ($/kg)	145.50	-
U_S ($/kg)	44.56	-
U_C ($/kg)	-	148.48
U_G ($/kg)	-	41.06
A ($/gm Pu metal)	12	12
B ($/gm Pu)	1.50	1.50
T ($/kg U)	2 + 18+) = 20	2 + 18+) = 20
i (%)	4	4
C_C ($/kg U)	5.60	5.60
C_R ($/kg U)	15.30	15.30

From these data

$$F_S = (17,520)\Big\{140 + [1 + (0.0075)(4)]\ 145.50$$
$$-(0.99)(0.9855)\ [(44.56 - 5.60) + (12-1.5)(4.48)]$$
$$+ 20 + (0.9855)\quad(15.30)\Big\}$$
$$+ \frac{(4)(54.000)(145.50)}{100} + D$$

+) Based on assumed commercial contracts of $ 2/kg for transportation from reactor to designated European port and $ 18 from European port to designated point in U.S.

(more)

$$F_S = 4,537,500 + D$$

Similarly, we have

$$F_C = (15,930)\Big\{C + [1 + (0.0075)(4)]\,(148.48) - (0.99)(0.9844)\,[(41.06 - 5.60) + (12-1.5)(4.598)] + 20 + (0.9844)(15.30)\Big\} + \frac{(4)(54.000)(148.48)}{100} + D$$

$$F_C = 15,930\ C + 2,015,500 + D$$

Setting the standard and the computed fuel cycle costs equal gives the relationship

$$15,930\ C + 2,015,500 = 4,537,500$$ 1/

From this relation,

C = 158.35 per kilogram of contained uranium, so that using the rounding rule stated in paragraph 20,

C = $ 159

This computed fabrication price is less than the manufacturer's offer, therefore, the USC will make available a type "B" guarantee. Under this guarantee the guaranteed-maximum fabrication cost would be $ 159 per kilogram of contained uranium.

1/ Note that this relationship is the same regardless of the value of D used to compute the standard and computed fuel cycle costs. Consequently the computed guarantee does not depend on the value of D used.

(more)

ANNEX 2

DETERMINATION OF MINIMUM INTEGRITY LIFE GUARANTEED UNDER TYPE "A" ARRANGEMENT

If the computed fuel cycle cost using the manufacturer's guarantees and determined in accordance with Annex 1 is no greater than the standard fuel cycle cost, and, if the remedies under the manufacturer's arrangement to supply fuel elements are not sufficient to cover the extra costs of reprocessing and transporting irradiated fuel elements and still meet the standard fuel cycle cost, the USC will supplement the manufacturer's guarantee by guaranteeing an average integrity life which, in combination with the guarantees offered by the manufacturer, will result in a computed fuel cycle cost equal to the standard fuel cycle cost.

The guaranteed average integrity life which is necessary to assure that the computed fuel cycle cost will equal the standard fuel cycle cost will depend upon the arrangement offered by the manufacturer. Treated below is the case that the manufacturer provides no guarantee on chemical processing or transportation charges. For details on other arrangements, interested parties are invited to consult the USC on the specific arrangements.

The computed fuel cycle cost for any average integrity life using the manufacturer's guarantee on fabrication cost and integrity life is given by the equation

$$F_M = T_M C_M + T_I \{(1 + 0.0075i)\ U_M - (0.99)(h)\ [(U_I - C_C) + (A-B)P_I] + T + hC_R\} + \frac{iR_M U_M}{100} + D$$

where

F_M = computed fuel cycle cost taking into account manufacturer's guarantee of fabrication cost and integrity life, \$/year

where

i, C_C, A, B, C_R, T, and D as defined in Annex 1

(more)

T_M = annual throughput of uranium at integrity life guaranteed by the manufacturer, kg/year

$$\left\{T_M = \frac{292{,}000\ P_T}{I_M}\right\}$$

P_T as in Annex 1

I_M = average integrity life guaranteed by the manufacturer, megawatt days per metric ton of contained uranium

C_M = fuel element fabrication cost offered by manufacturer, $ per kg of contained uranium

T_I = annual throughput of uranium at average integrity life I, kg/year

I = average integrity life, megawatt days per metric ton of contained uranium

h = ratio of weight of uranium contained in a fuel element discharged after a life I to the weight of uranium contained in the fresh element guaranteed by the manufacturer

U_I = EC credit for uranium hexafluoride of the assay of fuel elements discharged after a life I, $ per kg of contained uranium

P_I = plutonium content of the uranium in the fuel discharged after an average life of I, grams plutonium per kg of uranium contained in the discharged fuel elements

U_M = EC charge for uranium hexafluoride of the assay of the uranium in the fresh fuel elements guaranteed by the manufacturer, $ per kg of contained uranium

R_M = uranium contained in elements guaranteed by manufacturer required to permit reactor to reach design power level for its intended purpose, kg

Using the above equation, the fuel cycle costs for assumed average integrity lives are computed and compared with the standard fuel cycle cost computed according to Annex 1. The

(more)

average integrity life in the above formula which results in a computed fuel cycle cost equal to the standard fuel cycle cost is the average integrity life which the USC will guarantee under the type "A" arrangement.

To illustrate the use of the above equation, assume that for stainless steel clad elements the manufacturer guarantees an integrity life of 12,000 megawatt days and a fabrication cost of \$ 100 per kg. The data required to determine the standard fuel cycle cost are:

$$T_S = \frac{(292,000)(515)}{10,000} = 15,000 \text{ kg/year}$$

P_T = 515 megawatts

I_S = 10,000 megawatt days per metric ton of contained uranium

C_S = \$ 100

i = 4% per year

U_F = \$ 375.50

f = 0.985

U_S = \$ 220.00

C_C = \$ 5.60

A = \$ 12.00

B = \$ 1.50

P_S = 5 grams/kilogram

T = \$ 20

C_R = \$ 15.30

R_S = 25,000 kg

(more)

Using the equation for the standard fuel cycle cost in Annex 1 gives

$$F_S = (15,000) \Big\{ 100 + (1.03)(375.50) - (0.99)(0.985) \\ [(220 - 5.60) + (12 - 1.5)\ 5] + 20 + (0.985)(15.30) \Big\} \\ + \frac{(4)(25,000)(375.50)}{100} + D = 4,300,000 + D$$

The data required to determine the computed fuel cycle cost taking into account the manufacturer's guarantee depend upon the average integrity life assumed to be achieved. Trials suggest that assuming an average integrity life of 7,335 megawatt days per metric ton of contained uranium would give a fuel cycle cost equalling the standard fuel cycle cost of $ 4,300,000. The data for an average integrity life of 7,335 megawatt days per metric ton of contained uranium are the following:

$$T_M = \frac{(292,000 \text{x} 515)}{(12,000)} = 12,500 \text{ kg/year}$$

P_T = 515 megawatts

I_M = 12,000 megawatt days per metric ton

$$T_I = \frac{(292,000)(515)}{7,335} = 20,500 \text{ kg/year}$$

U_M = $ 391.40

h = 0.989

U_I = $ 276.75

C_C = $ 5.60

A = $ 12

B = $ 1.50

P_I = 4.20 grams/kilogram

T = $ 20

C_R = $ 15.30

R_M = 25,000 kg

(more)

Using the equation given in this Annex for the computed fuel cycle cost gives

$$F_M = (12{,}500)(100) + (20{,}500)\Big\{(1.03)(391.40) - (0.99)(0.989)\big[(276.75 - 5.60) + (4.20)(10.50)\big] + 20 + (0.989)(15.30)\Big\} + \frac{(4)(25{,}000)(391.40)}{100} + D = 4{,}300{,}000 + D$$

Thus, for an integrity life of 7,335 megawatt days per metric ton of contained uranium, the computed fuel cycle cost taking into account the manufacturer's guarantee is equal to the standard fuel cycle cost. Consequently, based upon the rounding rule the USC would make available a type "A" guarantee at an integrity life of 7,300 megawatt days per metric ton.

(more)

ANNEX 3

DETERMINATION OF COMPLIANCE WITH MINIMUM STANDARDS

The USC cost used in paragraph 34 is computed according to the following formula:

$$\text{USC cost} = (292{,}000\ P_T L)\left\{\frac{C_M + S + C_R + C_C}{I_M} - \frac{C_G + S + C_R + C_C}{I_G}\right\}$$

where

P_T = the reactor thermal power, megawatts

C_M = fuel element fabrication cost offered by manufacturer, \$/kilogram of contained uranium

S = commercial charge for transportation of spent fuel elements from agreed European port of shipment to designated point in the U.S., \$/kg of contained uranium. If commercial charges not available, assume \$ 20/kg.

C_R = as in Annex 1

C_C = as in Annex 1

I_M = fuel element integrity life guaranteed by manufacturer, megawatt days per metric ton of contained uranium

C_G = fuel element fabrication cost guaranteed by USC, \$/kg

I_G = fuel element integrity life guaranteed by USC, megawatt days per metric ton of contained uranium

L = life of core at manufacturer's guaranteed integrity life, years

For purposes of illustration, assume that a proposal for a core consisting of stainless steel clad fuel elements as specified in 9 (a) above is submitted on the basis of a

(more)

manufacturer's fabrication cost of \$ 120 per kilogram of contained uranium and a guaranteed integrity life of 9,000 MWD per metric ton. At the guaranteed irradiation this core will have a life of two years in a reactor with a thermal power of 550 megawatts. For this case, the U.S. guarantee would be an integrity life of 10,000 megawatt days per metric ton and a fabrication cost of \$ 100 per kilogram of contained uranium.

Using

S = \$ 20.00 per kilogram of contained uranium

C_R = \$ 15.30 per kilogram of uranium

C_C = \$ 5.60 per kilogram of uranium,

the above formula gives

$$\text{USC cost} = (292{,}000)(550)(2)\left\{\frac{120 + 40.90}{9{,}000} - \frac{100 + 40.90}{10{,}000}\right\}$$

$$= \$1{,}220{,}000$$

The pro rata share based upon delivering 150 megawatts of electric power from nuclearly generated heat is

$$\left(\frac{150}{1{,}000}\right)\left(\frac{2}{10}\right)(\$\ 90{,}000{,}000) = \$\ 2{,}700{,}000$$

Thus, the proposal would meet the criterion of paragraph 34.

(more)

ANNEX 4

DETERMINATION OF GUARANTEES FOR NOMINAL LOADINGS CONSISTING OF FUEL ELEMENTS CONTAINING URANIUM OF DIFFERENT ENRICHMENTS

The purpose of this annex is to describe the application of the formulae developed in the previous annexes to nominal loadings consisting of fuel elements which contain uranium of different enrichments. The principle used is that in determining the USC guarantees for such nominal loadings the appropriate fuel cycle cost is determined by averaging, according to the heat generation, the appropriate fuel cycle costs for fuel elements containing uranium of each enrichment comprising the nominal loading. In calculations requiring the adjustment of the manufacturer's guaranteed integrity lives (e.g., standard fuel cycle cost if the manufacturer's average guaranteed integrity life is different from the standard guaranteed integrity life), these lives shall be changed in proportion to the average guarantees.

The USC guarantee will apply to the average integrity life achieved by the nominal loading, however, in computing the average integrity life achieved, the life of elements which have not failed for integrity reasons shall be considered to be the greater of the actual life achieved or the proportional integrity life, mentioned above, for fuel of that enrichment.

The computed fuel cycle cost is the sum of the weighted computed fuel cycle cost for all different enrichments comprising the nominal loading. The weighted computed fuel cycle cost for a particular enrichment of fuel is the product of the computed fuel cycle cost for that enrichment determined according to the equation on page 3 of Annex 1 and the computed weighting factor for that kind of element. The computed weighting factor for each enrichment is the ratio of the heat generated in elements containing uranium of that enrichment to the total heat generated in the nominal loading. In calculating the computed weighting factor, the heat generation is based on the manufacturer's guaranteed integrity lives.

The standard fuel cycle cost is calculated in a similar manner but according to the equation on page 1 of Annex 1.

(more)

In this case, the integrity life used is the product of the manufacturer's integrity life for each enrichment and the ratio of the standard guaranteed life to the manufacturer's average guaranteed life.

If the computed fuel cycle cost is no greater than the standard fuel cycle cost, only a Type A guarantee will be made available. If the computed fuel cycle cost exceeds the standard fuel cycle cost, the USC will make available a Type B arrangement.

In cases where the Type B arrangement is made available, the determination of the USC extention of the manufacturer's guarantee is made in a manner similar to the methods used in Annex 1. These are:

1. If the manufacturer's offered average fabrication cost (this is the ratio of the total fabrication cost to the weight of uranium in a nominal loading) is less than the average standard guaranteed fabrication cost, then this cost (the manufacturer's) is what the USC will guarantee and appropriate calculations are made using the equation on page 1 of Annex 1 to determine the USC guaranteed integrity life.

2. If both the manufacturer's average fabrication cost and average integrity life exceed the USC guarantee, then the manufacturer's integrity life will be used in the equation on page 3 of Annex 1 to determine the USC guaranteed fabrication cost for elements of each enrichment. In performing these calculations, provision must be made to include the adjustments specified on page 7 of Appendix C for enrichments greater than 3 %.

3. In all other cases, the USC will make available the standard guaranteed integrity life and fabrication cost for the types of elements under consideration.

Under a Type A arrangement, the USC guaranteed integrity life for a nominal loading shall be determined so that the sum of the weighted guaranteed fuel cycle costs for all different enrichments comprising the nominal loading shall be equal to the standard fuel cycle cost for the nominal loading computed as described above. The weighted guaranteed fuel cycle cost for each enrichment is the product of the fuel cycle cost computed in accordance with page 1 of Annex 2 and the computed weighting factor. In computing this fuel cycle cost, the integrity life used for a particular enrichment shall be the product of the USC guaranteed integrity life and the ratio of the manufacturer's guaranteed integrity life for that enrichment to the manufacturer's average guaranteed integrity life.

(more)

APPENDIX "D"

REPORTING REQUIREMENTS

Since one of the major purposes of the U.S.-Euratom Joint nuclear power program is to provide European and American industry with information concerning the design, construction, operation and economics of nuclear power plants, special steps will be taken by the Euratom Commission and the U.S. Atomic Energy Commission to assure the prompt exchange and dissemination of such information developed under the program. Among the obligations assumed the participants in the program will be required to provide the Euratom Commission and the U.S. Atomic Energy Commission with periodic reports which will be specified later. To the extent required these reports also will serve the needs of the Export-Import Bank in connection with any capital loans provided by Euratom under the line of credit from the Export-Import Bank. Participants under the program will not be obliged to report or engage in any exchanges of manufacturing "know-how" or techniques. Exchanges of this kind will continue to be the subject of licensing and other normal commercial arrangements. Although the detailed requirements will be developed in the future, it is anticipated that the reports requested will include the following:

a) Designs, plans and specifications

Participants will be required to provide Euratom and the USAEC with copies of the descriptive brochures, operating manuals, designs, plans and specifications received from their respective contractors. This requirement will be limited to the information received by the selected enterprises in the course of their normal business dealings with their contractors.

b) Construction progress reports

Upon initiation of detailed design and construction, enterprises will be required to furnish a quarterly construction progress and cost report, the format of which will be developed with each participant. A suitable final report will be required upon completion of construction.

c) Operations

Starting with the initial operation, periodic progress as well as summary cost reports will be required.

(more)

The progress reports will be quarterly and will briefly include such things as:

The plant operating efficiency during the report period, including data on power levels and the percentage of time the plant is in operation, a report on shutdowns and/or reduction in power output due to hazards considerations with a description of the causes; total fuel cycle activities including loading and unloading, fuel element operating experience including the exposure levels and number failures encountered, experience gained with the monitoring and control system, the reactivity balance of the reactor over the reporting period and other items of particular interest to the joint program.

The operating cost reports, to be submitted on a semi-annual basis, will be designed to obtain comparable cost data from the plants included in the program.

d) Other

Other specialized reports may be requested by Euratom and the USAEC from time to time. However, an effort will be made to keep such additional requirements at a minimum consistent with the requirements of the joint program. The reporting requirements associated with any research and development contracts entered into by Euratom and the US with the enterprises operating the plants will be agreed to when these contracts are negotiated.

(more)

APPENDIX "E"

I. Identity of proposer

Name

Business address

Seat (Legal address)

Legal status

II. Financial and/or other relationship between proposer and operator of project, if these are different persons

III. Brief description of the project, including:

Location
Size of plant (Net electrical capacity)
Discussion of possible benefit to be gained by the proposer and the Euratom - United States program if project were selected for operation by December 31, 1965. Among other things, the discussion should cover the extent to which such a project would represent an advancement in technology over reactors considered available for operation by December 31, 1963.

IV. Plans for the distribution of the electricity to be generated.

# # #

ERRATA

Appendix C/2, page 58, 2nd paragraph, 4th line (7th line from top on original cap):

After the words "...under commercial guarantee..." (add:) contracts which may result in or have bearing on a claim under the USC guarantee (before the words:) ".....by either reactor....."